CARBON
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Methodology

Clean Alternative Assessment Methodology

Ready to Transition

An evidence-based method for assessing clean alternatives and phasing out fossil-fuelled plant.

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Taking flight from Revelstoke Mountain Resort, BC, Canada. © Tom Poole.

VERSION DETAILS

Table 1: Version Details

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Each version of this document is identified by its version number, publication date, and effective date as stated above. The organisation is responsible for referencing a document version with an effective date that meets the requirements of the NoCO2 Net Zero Standard applicable for the reporting period for which the Standard is being employed.

LICENCE

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1. SCOPE

This methodology specifies the procedures for conducting a Clean Alternative Assessment as required by section 4.7.2 of the NoCO2 Net Zero Standard.

The purpose of this methodology is to provide a structured, evidence based, and reproducible approach for:

a) evaluating the readiness of clean energy alternatives for each fossil fuel consuming plant type operated by the organisation;

b) deriving a Readiness Score from the evaluation of alternative technology against the readiness criteria defined in this methodology; and

c) determining the Cease New Acquisition Year and Cease All Use Year applicable to each assessed plant type.

2. REFERENCES

2.1. NORMATIVE

The following referenced documents are required for the application of this methodology:

- NoCO2 Net Zero Standard

2.2. INFORMATIVE

The following referenced documents are informative and may assist in the application of this methodology:

- Australian Taxation Office (ATO): Income Tax Assessment (Effective Life of Depreciating Assets) Determination 2025
- Australian Competition and Consumer Commission (ACCC): Australian Petroleum Industry Quarterly Reports
- Australian Energy Regulator (AER): Default Market Offer Price Determinations
- Reserve Bank of Australia (RBA): Historical Exchange Rates
- Clean Energy Regulator (CER): Safeguard Mechanism Baseline Guidance
- Clean Energy Regulator (CER): National Greenhouse and Energy Reporting (Measurement) Determination

3. CONVENTIONS

To ensure clarity and consistency, this standard uses specific terminology to indicate the nature of the organisation's obligations. The following terms apply throughout the document, where:

- **shall** indicates a mandatory requirement;
- **should** indicates a recommendation for best practice; and
- **may** indicates a permissible action.

4. TERMS & DEFINITIONS

- **Capital Premium:** The difference between the acquisition cost of the clean technology alternative and the cost of the fossil incumbent, expressed as a proportion of the fossil incumbent price. Also referred to as the green premium.
- **Cease New Acquisition Year:** The Year from which the organisation shall no longer acquire or commission newly manufactured instances of plant within the assessed type, whether by purchase, lease, novated lease, hire, or other arrangement that places a previously unused fossil fuel powered asset manufactured after the Year into the operational control of the organisation.
- **Cease All Use Year:** The year from which the organisation shall dispose of plant within the assessed type, and no longer operate instances of the type through hire or similar mechanisms.
- **Clean Alternative:** A technology not powered by fossil fuels capable of performing the same functional tasks as the incumbent plant type.

- **Hurdle Rate:** The minimum acceptable rate of return on the capital premium. Set at 5%, representing the organisation's cost of capital.
- **Incumbent Plant:** The fossil fuel powered plant type currently in operational use by the organisation.
- **Internal Rate of Return (IRR):** The discount rate at which the net present value of operational savings over the assessment horizon, relative to the capital premium, equals zero.
- **Readiness Score:** The resultant score from evaluation of alternative technology based upon the readiness criteria defined in this methodology.
- **Service Life:** The expected operational life of the plant type, used as the assessment horizon for financial calculations.

5. FRAMEWORK

The assessment follows a structure pipeline, repeated annually:

- Identify plant types
- Profile incumbent operations
- Classify operational context
- Assess against six readiness criteria
- Calculate Readiness Score
- Derive cessation years

5.1. PLANT TYPE IDENTIFICATION

The organisation shall undertake a comprehensive stocktake of all fossil fuel consuming asset types operated by the organisation (e.g. passenger vehicles, excavators, generators).

For each identified plant type, the organisation shall document:

a) the functional role of the plant within the organisation's operations; and

b) the industry activity or sub-activity in which the plant is used.

The organisation should classify plant into meaningful groupings informed by the asset classifications in Table A and Table B of ATO Income Tax Assessment (Effective Life of Depreciating Assets) Determination. Where the operational profile or clean technology availability would materially differ between items within a single asset classification, the organisation should apply more granular groupings (e.g. operating weight class for heavy plant, gross vehicle mass for goods vehicles).

5.2. INCUMBENT PLANT ANALYSIS

For each plant type identified under 5.1, the organisation shall establish the operational parameters of the fossil powered incumbent within the relevant industry activity context.

5.2.1. SERVICE LIFE

The organisation shall determine the service life of the plant type. The service life shall be sourced from ATO Income Tax Assessment (Effective Life of Depreciating Assets) Determination, unless the organisation can demonstrate, with documented evidence, that a materially different service life applies to the specific operational context.

The service life shall be used as the assessment horizon for all financial calculations under this methodology.

5.2.2. OPERATIONAL PARAMETERS

The organisation shall determine the following parameters for each plant type:

- Shifts Per Day: The typical number of operational shifts per day.
- Operating Days Per Year: The typical number of days per year the plant type is in active use.
- Shift Length: The duration of a single operational shift.
- Utilisation Factor: The proportion of shift time during which the plant is under load.
- Fuel Consumption: The average fuel consumption rate under typical operating conditions.
- Primary Energy (kWh): The total chemical energy content of fuel consumed per shift.

- Engine Thermal Efficiency: The efficiency at which the plant engine converts fuel energy to driveshaft energy.
- Incumbent Drivetrain Efficiency: The efficiency of the mechanical and/or hydraulic drivetrain from engine crankshaft to the point of work application (e.g. wheels, blade, bucket). Captures losses in transmissions, hydraulic pumps, valves, actuators, PTOs and gearboxes.
- Useful Energy (kWh): The mechanical work delivered at the point of application per shift (Primary Energy x Engine Thermal Efficiency x Incumbent Drivetrain Efficiency)

5.2.3. FEASIBLE ALTERNATIVE CLASS

The organisation shall determine the feasible alternative class: the size, weight, or power band of clean technology alternatives that could credibly perform the same job as the fossil powered incumbent.

The feasible alternative class shall be expressed as a range with a specified unit (e.g. 15-25 tonnes operating weight, 100-150 kW rated power) and shall be used to constrain the product search under the readiness criteria assessment (5.4).

Where the feasible alternative class is expressed as operating weight, the organisation shall also document the derived functional specifications the weight band represents for the asset type (e.g. blade width and engine power for graders, bucket capacity and breakout force for excavators, payload and lift height for loaders). Clean alternative products shall be considered within class where they meet the derived functional specifications, even where their operating weight falls outside the nominal band due to BEV mass differences.

5.2.4. CHARGING OPPORTUNITY

The organisation shall determine the charging opportunity, representing the window of time available per shift during which the plant is stationary and could feasibly receive energy. This includes:

- off-shift periods (overnight, between shifts);
- scheduled breaks and shift changeovers; and
- natural operational downtime (e.g. loading/unloading cycles, inspections).

The charging opportunity, together with the useful energy demand, determines the minimum charge power required and informs the selection of the readiness criteria.

5.3. OPERATIONAL CONTEXT CLASSIFICATION

The operational profile established under 5.2 shall be used to classify three contextual parameters that frame the entire readiness assessment. These contextual classifications inform how each subsequent readiness criterion is evaluated; the same technology may score very differently depending on whether it is operating from a fixed urban depot compared to a remote mobile worksite.

5.3.1. OPERATING REGIME

The organisation shall classify the operating regime of each plant type by selecting the option that most accurately reflects the plant's typical operational pattern:

Operating Regime	Description
Depot Based	Plant operates daily routes or conducts works away from a hub, but returns to a central depot for overnight parking. May return multiple times per shift for loading/unloading.
Fixed Facility, Urban	Plant never leaves a specific, permanently owned boundary in an urban setting.
Fixed Facility, Rural	Plant never leaves a specific, permanently owned boundary in a rural setting.
Fixed Facility, Off Grid	Plant never leaves a specific, permanently owned boundary with no grid connection. All energy shall be generated on site.
Mobile Works, Urban	Shifting or linear work zones in built-up areas with high time pressure to minimise disruption.
Mobile Works, Rural	Shifting or linear work zones in remote areas with long transit distances between site and depot.
Site Based Works, Urban	Fixed site work zone for a defined period in an urban area.
Site Based Works, Rural	Fixed site work zone in a remote or greenfield area.
Emergency / On Call	Plant required to be operational at 100% capacity with zero lead time for emergency response.

5.3.2. ALTERNATIVE ENERGY BASE

The organisation shall classify the alternative energy base, representing the primary energy source for the clean technology alternative, by selecting one of the following options:

Alternative Energy Base	Description
Electric, Battery, Plug-in	Battery electric with plug-in charging from the electrical grid.
Electric, Battery, Swappable	Battery electric with swappable battery packs — depleted packs exchanged for charged ones.
Hydrogen, Fuel Cell	Hydrogen fuel cell electric drive.
Clean Fuels	Drop-in or near drop-in alternative fuels (renewable/synthetic diesel). Typically chosen for plant engaged in emergency operating regimes.

The selection shall be informed by a structured review of the clean technology products currently available within the Feasible Alternative Class determined under 5.2.3. The organisation shall survey the OEM landscape to identify commercially available or near commercial clean alternatives capable of performing the functional role of the incumbent plant type.

Where one or more battery electric or hydrogen fuel cell products exist within the Feasible Alternative Class, whether from established OEMs or credible emerging manufacturers, the organisation shall select the corresponding energy base and proceed to classify the Energy Delivery Method (5.3.3) and assess the technology against the Readiness Criteria (5.4).

Where the OEM survey identifies no clean technology products within the Feasible Alternative Class that could credibly perform the required functional role, the organisation shall classify the alternative energy base as Clean Fuels.

5.3.2.1. CLEAN FUELS

A classification of Clean Fuels indicates that no viable electrification or hydrogen pathway currently exists for the assessed plant type. It is not a determination that the plant type will never transition to zero emission technologies but rather reflects the current state of the original equipment manufacturer (OEM) market at the time of assessment.

Because there is no scoreable clean technology alternative, the Readiness Criteria assessment (5.4) cannot be performed. The organisation shall not proceed with further assessment for that plant type. The organisation shall assign a:

a) Cease New Acquisition Year of 2045; and a
b) Cease All Use Year of 2050.

These represent the latest permissible cessation dates under this methodology. They are assigned not because the technology has been assessed and found deficient, but because there is presently no product against which to conduct an assessment. The dates ensure that even plant types without a current clean alternative pathway remain subject to a defined transition obligation.

The organisation shall reassess the alternative energy base classification in each subsequent reporting period as required by section 6. As OEMs bring new products to market, a plant type previously classified as Clean Fuels may transition to a battery electric or hydrogen fuel cell classification, at which point the full assessment shall be performed and a scored cessation year derived. In practice, for plant types where the energy demands are modest and operational context is favourable, the availability of a single credible OEM product may be sufficient to trigger this reclassification.

5.3.3. ENERGY DELIVERY METHOD

The organisation shall classify the alternative delivery method (i.e. how the clean technology alternative receives energy) by selecting an option that is compatible with the chosen alternative energy base from the following options.

Energy Base	Delivery Method	Description
Electric, Battery, Plug-in	Off Shift, Grid Charging, Unbuffered	Plant is charged during downtime (e.g. overnight) directly from the grid. This assumes the local grid connection capacity exceeds the peak charging power draw of all plant at the facility, thus requiring no energy storage (BESS) to manage demand or "top up" power availability.
	Off Shift, Grid Charging, Buffered	Plant is charged during downtime, but local grid capacity is insufficient for all plant to reach sufficient charge levels during available charging windows. An on site Battery Energy Storage System (BESS) is required to "buffer" the grid. BESS charges from the grid when spare capacity exists on grid connection and supplements charging to the plant off shift.

Energy Base	Delivery Method	Description
	Mid Shift, Grid Charging, On Site, Unbuffered	Plant undergoes "opportunity charging" during breaks or mid shift intervals using high power chargers connected directly to the grid. Requires sufficient capacity grid connection relative to potential peak charging loads of facility plant without the aid of local storage.
	Mid Shift, Grid Charging, On Site, Buffered	Plant is charged mid shift, but the grid connection cannot support the high power bursts required for rapid opportunity charging. An on site BESS stores energy throughout the shift and "discharges" it rapidly to the plant during breaks to achieve high charging speeds without overloading the grid.
	Mid Shift, Grid Charging, Off Site	Plant leaves the active work zone mid shift to travel to a nearby public or third party high power charging hub. This is typically only feasible for road registered plant (e.g. HGVs, vocational vehicles) where the transit time likely doesn't critically impact the shift's productivity.
Electric, Battery, Swappable	Mid Shift, Battery Swap, On Site, Local Recharge	Depleted batteries are swapped for fresh ones at the site of operation. Local cache of batteries are recharged onsite using either a grid connection or microgrid. Requires specialised handling equipment (cranes/loaders). Potential application for high utilisation plant where charging downtime is unacceptable and power demands are high.
	Mid Shift, Battery Swap, On Site, Remote Recharge	Modular battery packs are swapped out of the plant and replaced with fresh units delivered via service truck. Depleted packs are taken off site to charge (potentially by 3rd party). Minimises downtime to "refuelling" speeds, but requires specialised battery swap capable plant, and lifting equipment to swap batteries.
	Mid Shift, Battery Swap, Off Site	Plant drives to a central depot or specialized "swap station" to exchange batteries. Requires the plant to be mobile enough to make the trip without excessive impact upon shift productivity.
Electric, Battery, Plug-in	Mid Shift, Mobile Battery Trailer	A high-capacity battery trailer (e.g. >500kWh) is delivered to the plant/site. The plant plugs into the trailer for rapid DC charging mid shift. High flexibility for shifting work zones (Rural/Urban Mobile), but requires the plant to be stationary during the charge window.
Hydrogen, Fuel Cell	Mobile Compressed Delivery	Compressed hydrogen gas (200–500 bar) is delivered to site by road, either as a drop-and-leave tube trailer that acts as temporary on site storage, or via a dedicated refuelling truck that dispenses directly to plant and departs (analogous to a diesel bowser run). Tube trailers are suited to sites with steady multi-day demand and hardstand space, while refuelling trucks suit shifting work zones or sites where leaving a trailer is impractical. Both modes carry approximately 200–500 kg of usable H_2 per delivery. Also viable as a low-capex entry point for fixed depots in early stages of hydrogen adoption, before demand justifies permanent storage or on site production.
	On Site Electrolyser	Green hydrogen is produced on site via an electrolyser powered by the facility's grid connection or co-located renewables. Output hydrogen is compressed and stored in on site tanks for dispensing to plant. Eliminates transport logistics entirely but requires significant electrical capacity (approx. 50–55 kWh per kg H_2), a water supply, and space for the electrolyser, compressor, and buffer storage. Most viable for high utilisation, fixed facility operations with strong grid or renewable access.
	Bulk Liquid Delivery to On Site Storage	Liquefied hydrogen (LH_2) is delivered by cryogenic tanker to permanent on site storage vessels (vacuum-insulated tanks at −253°C). A vaporiser converts LH_2 back to gas for dispensing to plant at the required pressure. Liquid delivery carries approximately 5–10x the hydrogen mass per truckload compared to compressed gas tube trailers, making it suited to high demand, fixed facility sites. Requires specialised cryogenic storage, boil-off management systems, and trained personnel. The permanent storage decouples delivery frequency from daily consumption, providing a buffer against supply chain disruptions.
	Pipeline Supply to On Site Storage	Hydrogen is delivered continuously via a dedicated or blended gas pipeline to on site compression and storage equipment. Plant refuels from the on site buffer storage via a dispenser. Only feasible where hydrogen pipeline infrastructure exists or is being developed (e.g. hydrogen hubs, industrial precincts). Offers the lowest per-kg delivery cost at scale and eliminates truck logistics, but the capital cost of pipeline connection and the geographic limitation to pipeline corridors make this a long-term option relevant primarily to large fixed facilities in designated hydrogen precincts or industrial zones.
Clean Fuels	Clean Fuel Delivery	Do not proceed with further assessment from here.

5.4. READINESS CRITERIA

Each clean technology alternative shall be assessed against six readiness criteria. Two criteria act as gates; if the technology fails either gate, the assessment proceeds to scoring but the gate failure is recorded and affects the cessation year derivation.

5.4.1. OUTCOME EQUIVALENCE

Outcome Equivalence assesses whether the clean technology alternative can feasibly perform the required functional tasks of the plant within its specific operating context, without materially compromising net output.

The organisation shall assess three sub-items. All three shall pass for the criterion to pass; failure of any item constitutes an overall failure.

a) **Duty Cycle & Charging Demands:** Can the alternative maintain the required output per shift or duty cycle without requiring changes to the site's core operational schedule that result in a material loss of productivity?

  – **Pass:** Output is maintained; recharging or refuelling fits into the existing workflow. Mid-shift charging is not an automatic failure if the recharge window aligns with natural site downtime (e.g. lunch breaks, shift changeovers, scheduled inspections) or utilises swap-and-go technology.
  – **Fail:** The machine requires significant downtime during active work hours to recharge, lowering total daily productivity materially compared to the fossil incumbent.

b) **Performance Requirements:** Can the alternative meet the required physical outcomes demanded by the specific application within a shift?

- **Pass:** The alternative meets or exceeds the performance requirements of the task (e.g. mass moved, distance travelled, throughput volume).
- **Fail:** The machine's performance profile is insufficient for the specific application.

c) **Environmental Resilience:** Can the alternative operate reliably within the specific physical environment of the site?

- **Pass:** The technology is rated for the site's ambient conditions (temperature extremes, high dust, vibration, grade/incline).
- **Fail:** Environmental factors significantly degrade the machine's lifespan, safety, or performance.

5.4.2. CAPITAL PARITY

Capital Parity assesses how the upfront procurement cost of the clean technology alternative compares to the current market purchase price of the fossil-powered incumbent.

Scope
The comparison shall include the base machine price and any essential hardware required for operation, but shall exclude energy delivery infrastructure costs (e.g. charging stations, grid upgrades, battery energy storage systems, hydrogen dispensing equipment). Infrastructure costs are assessed separately under Infrastructure Requirements.

Fossil Benchmark
The organisation shall establish the fossil benchmark price as the market median acquisition price of the incumbent plant type from a minimum of five Original Equipment Manufacturers (OEMs). The benchmark shall be representative of the Australian market for the relevant size and specification class.

The fossil benchmark price shall be calculated as the procurement weighted price across the top five fossil OEMs at weights of 30 % / 25 % / 20 % / 15 % / 10 % (highest to lowest procurement likelihood). Where more than five OEMs are surveyed, only the top five contribute to the weighted price.

Clean Alternative Pricing
The organisation shall identify clean technology alternative products within the Feasible Alternative Class and determine their acquisition prices. Where Australian dealer pricing is not available, international pricing may be used with documented adjustments for freight, import duties, and dealer margins.

Where multiple clean alternative products are available, the organisation weight the top three products by procurement likelihood:
- 1 product = 100%;
- 2 products = 60% / 40%;
- 3 or more = 50% / 30% / 20% (top 3 only).

Procurement Likelihood Hierarchy
OEMs shall be ranked against the following four criteria, in order of priority:

1. Australian dealer and distribution presence: the OEM operates an established Australian dealer network capable of supplying, delivering, and supporting the plant within standard procurement timeframes.
2. Quality of pricing evidence: firm dealer quotes rank above published list prices, which in turn rank above analyst derived or import adjusted estimates.
3. Specification match to the incumbent duty cycle: the OEM's product specifications align with the operational requirements established under 5.2 (size, power, attachments, performance characteristics).
4. Australian aftermarket support: local availability of spare parts, factory trained technicians, and service agreements over the asset's service life.

Where two OEMs rank similarly across the criteria, the organisation should give greater weight to those higher on the list (dealer presence and pricing evidence). The ranking shall be documented alongside the weighted price calculation.

Premium Calculation

The organisation shall establish the capital premium of relevant clean alternatives using the established benchmark prices, calculated as:

Capital Premium = (Clean Alternative Price − Fossil Benchmark Price) / Fossil Benchmark Price

Where multiple clean alternative products are available, the organisation should apply a weighted blend across products ranked by procurement likelihood (considering Australian distribution, pricing evidence quality, specification match, and aftermarket support).

Classification

The organisation shall classify Capital Parity by selecting the option corresponding to the calculated premium:

Classification	Premium Band	Score
High	< 25%	+15
Medium	25% – 50%	+5
Low	50% – 100%	0
Very Low	100% – 250%	−5
Extremely Low	> 250%	−10

5.4.3. INTERNAL RATE OF RETURN

Internal Rate of Return assesses the annualised yield generated by the capital premium required for the clean technology alternative. It measures the financial efficiency of the additional investment compared to the fossil fuel baseline, evaluating whether the resulting operational savings over the asset's service life exceed the 5% hurdle rate.

Inputs

The following inputs shall be used in the assessment. Where standardised reference values are provided within Annex A, the organisation shall use those values as the base case.

- **Fuel Price Per Litre:** Sourced from organisational primary activity data.
- **Electricity Price Per kWh:** Sourced from organisational primary activity data. This value may differ between assessments of individual plant e.g. modelling of plant types charging out of different facilities at different times may have different
- **Annual Fuel Cost (Incumbent):** Equal to the Fuel Consumption (L/hr) × Annual Operating Hours × Fuel Price.
- **Annual Electricity Cost (Clean Alternative)**: Equal to Annual Electrical Demand × Electricity Price, where:
    - BEV Equivalent Demand per Shift = Useful Energy per Shift × (1 − Task Efficiency Credit)
    - Shift Electrical Demand = BEV Equivalent Demand / Wall-to-Wheel Efficiency
    - Annual Electrical Demand = Shift Electrical Demand × Operating Days per Year × Shifts per Day
- **Wall-to-Wheel Efficiency:** Selected from Annex A reference values by relevant drivetrain architecture.
- **Task Efficiency Credit:** Selected from Annex A reference values by relevant duty profile. Accounts for improved energy efficiency of electric drivetrains in producing same amount of useful work (e.g. regenerative braking).
- **Maintenance Cost Differential:** Annual Incumbent Maintenance Cost × Maintenance Reduction Percentage.
    - The Annual Incumbent Maintenance Cost should be sourced from organisational primary activity data. Where primary data is not available, the organisation may apply estimates derived from literature and shall document the basis.
    - The Maintenance Reduction Percentage shall be the value for the applicable plant category in Annex A. The organisation may override with product specific evidence; the category reference value shall then be tested as a sensitivity scenario.
- **Battery Replacement Cost and Timing:** For battery electric alternatives, the organisation shall determine whether battery replacement is required within the service life, and if so the year and cost. The replacement methodology is defined Annex B.
- **Carbon Price Per tCO_2e:** Used only for the Negative (With Cost of Carbon) classification check (see below). Sourced from the Australian Safeguard Mechanism reference level.
- **Service Life:** As determined under 5.2.1.

Cash Flow Schedule

The organisation shall construct a cash flow schedule for the assessment horizon:

Year 0: Capital Premium (Outflow)
Year 1 to N: Annual Operational Savings (Inflow) = Fuel Savings + Maintenance Cost Differential
Year R (if applicable): Battery Replacement Cost (Outflow)

Fuel Savings = (Annual Fuel Cost of Incumbent) – (Annual Electricity Cost of Alternative)
Maintenance Cost Differential = Annual Incumbent Maintenance Cost × Maintenance Reduction Percentage

IRR Calculation
The Internal Rate of Return shall be calculated as the discount rate at which the net present value of the cash flow schedule equals zero where:

$$NPV = -\text{Capital Premium} + \Sigma\,(\text{Annual Savings} / (1 + IRR)^{t}) - \text{Battery Replacement} / (1 + IRR)^{R} = 0$$

Where multiple clean alternative products are available, the organisation should compute the IRR for at least three individual products and apply a weighted blend, using the same weighting as Capital Parity.

Product Blending
Where multiple clean alternative products are available, the organisation shall compute the IRR independently for each of the top three products by procurement likelihood, then combine using the following weights:
- 1 product = 100%;
- 2 products = 60% / 40%;
- 3 or more = 50% / 30% / 20% (top 3 only).

Procurement likelihood shall be assessed against four criteria:
- Australian dealer or distribution presence;
- quality of pricing evidence;
- specification match to the incumbent duty cycle; and
- Australian aftermarket support.

Additional products may be documented but shall not contribute to the blended IRR.

Sensitivity
The organisation shall test the sensitivity of the IRR to variations of ±20% in diesel price and ±20% in electricity price, and shall document whether these variations would change the classification.

Carbon Cost Check
Where the base case IRR is negative (i.e. the clean alternative does not recover the capital premium through operational savings alone), the organisation shall recalculate the IRR with the additional inflow of avoided carbon cost savings where:

Annual Carbon Savings = [Annual Fuel Consumption (litres) × CO_2 Factor (kg CO_2/litre)] / [1000 × Carbon Price (\$/tCO_2e)]

If the IRR remains negative with carbon cost savings included, the classification shall be Negative (Incl. Cost of Carbon).

Classification
The organisation shall classify Internal Rate of Return by selecting the option corresponding to the calculated IRR:

Classification	IRR Band	Score
Excellent	> 10%	+15
Good	8% – 10%	+10
Fair	5% – 8%	+5
Poor	0% – 5%	0
Negative (Excl. Cost of Carbon)	< 0%	−7
Negative (Incl. Cost of Carbon)	< 0%	−14

The "Negative (Incl. Cost of Carbon)" classification shall only be assigned where the IRR remains negative after applying the carbon cost check.

5.4.4. INFRASTRUCTURE REQUIREMENTS

Infrastructure Requirements assesses the scale and cost of the energy delivery infrastructure required to support the clean technology alternative. This is a qualitative measure of the secondary investment required before the first unit of alternative plant can be utilised.

The organisation shall classify Infrastructure Requirements by selecting the option that most accurately reflects the infrastructure burden:

Classification	Hardware Considerations	Indicative Charging Demand	Electrical Grid Considerations	Score
Very Low	Minimal impact. Zero site modification. Equipment is portable or utilises existing surfaces and standard outlets.	< 15 kW	Supported by existing 15A–20A outlets. Zero modification to the board.	+3
Low	Fixed installations. Requires minor civil or electrical works (e.g. DC fast charging stations, dedicated cabling). Uses standard commercially available hardware.	< 55 kW	Requires dedicated circuits. Fits within a standard 80A–100A basic connection.	+1
Medium	Augmented supply. Requires battery energy storage systems for peak shaving, or specialised swap-and-go equipment.	< 150 kW	Requires CT switchboard upgrade or BESS/load management.	−3
High	Utility scale. Requires a significant grid upgrade, such as a new kiosk substation, high voltage connection, or dedicated microgrid.	< 1 MW	Requires a dedicated main switchboard or kiosk substation.	−8
Very High	New energy ecosystem. Requires on-site hydrogen generation/storage or permanent fuel transformation plant. Represents a multi-million dollar capital project independent of the alternative plant purchase.	> 1 MW	Exceeds typical local grid capacity. Likely requires a dedicated high voltage feeder from the nearest zone substation.	−10

When classifying Infrastructure Requirements, the organisation should consider both the site level hardware required to deliver energy to the alternative plant (e.g. charging stations, cabling, switchboard upgrades, battery energy storage systems, hydrogen dispensing equipment) and the upstream grid or network constraints that may affect the feasibility of that hardware (e.g. available capacity on the local distribution network, the need for transformer upgrades, network augmentation applications, or connection agreements with the distribution network service provider). A classification should reflect the combined burden of both considerations; site hardware alone may fall within a lower band, but the grid upgrade required to support it may push the overall classification higher.

5.4.5. INTEGRATION COMPLEXITY

Integration Complexity assesses the degree of operational change required to adopt the clean technology: the friction introduced by new refuelling, maintenance, or operational requirements compared to the established fossil fuel baseline.

The organisation shall classify Integration Complexity by selecting the option that most accurately reflects the operational change burden:

Classification	Description	Score
Very Low	Seamless. Direct replacement for existing workflows. No change to operator behaviour or logistics. Charging or refuelling occurs during existing off-shift downtime.	+4
Low	Minor. Requires modest adjustments to scheduling or modest retraining of existing staff. Includes opportunity charging during breaks or shifting parking locations. Core production workflow remains intact.	+2
Medium	Moderate. Requires active intervention mid-shift. Examples include battery swapping or specialised refuelling protocols that require dedicated personnel, specialised equipment, or precise timing.	0

High	Disruptive. Requires a fundamental overhaul of site logistics and safety. Examples include hydrogen on-site production and storage, high-pressure decanting, or reliance on third-party logistics for energy delivery.	−3

5.4.6. MARKET MATURITY

Market Maturity assesses the commercial maturity and support ecosystem for the clean technology alternative — the number of OEMs, lead times, and localised availability of technicians and spare parts.

This criterion has a dual function:

a) **Failure Gate:** Technologies classified as Pilot or Concept cannot be commercially procured and therefore trigger a failure.

b) **Criteria Score:** Technologies that pass the gate (Emerging or above) also contribute a score reflecting the depth of the commercial ecosystem.

Classification	Description	Score
Mature	High volume production, multiple competing OEMs, and a robust second-hand market.	+3
Established	Multiple OEMs offer the plant as a standard catalogue item. Local dealer networks provide support and stocked spare parts.	+1
Emerging	Limited OEMs (2–3) with proven commercial units, or a significant tier-one global OEM within the category. Support is available but may require specialists. Significant early adopter risk remains.	−3
Pilot	Pre-commercial. Technology is only available as a trial or from a limited number of non-global OEMs. No established local support network.	Fail
Concept	Theoretical. Lab-phase only. No path to procurement within a standard replacement cycle.	Fail

5.5. READINESS SCORE CALCULATION

The Readiness Score shall be computed as the sum of the scores from the five scored dimensions:

Readiness Score = Capital Parity + Internal Rate of Return + Infrastructure Requirements + Integration Complexity + Market Maturity

Outcome Equivalence contributes a score of zero when it passes; when it fails, it does not contribute a numeric score but triggers a gate failure that affects the Cease Date Derivation (5.6).

The theoretical range of the Readiness Score is −40 to +40.

Capital Parity and Internal Rate of Return carry the highest weighting, reflecting that financial viability is the primary driver of adoption feasibility.

5.6. CESSATION YEAR DERIVATION

The Readiness Score shall be used to determine the Cease New Acquisition Year and Cease All Use Year for each assessed plant type, according to the following table:

Readiness Score	Cease New Acquisition Year	Cease All Use Year
Any fail	2045	2050
< 0	2045	2050
< 5	2038	2043
< 10	2034	2039
< 20	2032	2037
< 25	2031	2036
< 30	2030	2035
< 35	2029	2034
≤ 40	2027	2032

A cease year takes effect from the start of the reporting period that commences on or after 1 January of that associated cessation year. For example, where the cease year is 2030 and the organisation's reporting period commences on 1 July, the requirement applies from the reporting period commencing 1 July 2030.

The requirements attaching to the Cease New Acquisition Year and the Cease All Use Year, including when each takes effect, are set out in the NoCO2 Net Zero Standard section 4.7.2.

A high Readiness Score indicates that the clean technology alternative is ready for adoption, and the transition timeline is correspondingly short. A low or negative score indicates that significant barriers remain, and more time is allowed for the technology to mature.

Every score band maps to a fixed year. There is no circumstance under which a plant type is exempt from a cessation date; technologies that fail threshold gates or achieve negative scores are assigned the latest possible deadline (2045/2050), reflecting the expectation that all fossil fuel plant shall eventually be transitioned.

5.6.1. LOW USE EXEMPTION

Any individual item of plant used for less than 100 hours per year may be excluded from assessment associated cessation years. For such plant the organisation shall use a:

a) **Cease New Acquisition Year** of **2045**; and a
b) **Cease All Use Year** of **2050**.

All plant excluded under this exemption shall be disclosed within the PDS.

6. REASSESSMENT

All plant owned and operated by the organisation shall be assessed in each reporting period. As technologies mature, the Readiness Score of a previously assessed plant type may increase when compared to prior reporting periods, bringing forward associated cessation dates.

Where the cessation date of a plant type has been brought forward via an increasing Readiness Score to a year that has either passed or is within 12 months of the end of the current assessment period, the organisation may delay meeting the requirements of the cessation year until the end of the subsequent reporting period.

All plant excluded under this grace period exemption shall be disclosed within the Public Disclosure Statement (PDS).

ANNEX A REFERENCE VALUES

The following reference values are published by CRI for use as the base case in assessments under this methodology. Values are reviewed and updated as specified.

Table A.1 –Reference Values

Parameter	Value	Source/Detail
Maintenance cost reduction (BEV)	See Table A.2	CRI plant category specific estimates
Battery replacement base cost	$200/kWh	BNEF 2025 Battery Price Survey, heavy equipment LFP packs
Battery cost annual decline	5% per annum	Conservative estimate (observed 8–15%)
Battery cost floor	$130/kWh	McKinsey Battery 2035 incl. heavy equipment premium estimate
Pack cycle life	4,000 EFCs	BNEF 2025 Battery Price Survey; CATL/BYD LFP cell specifications (4,000-6,000 cycles to 80 % SoH; 4,000 conservative)
Pack level efficacy factor	0.85	Cell to cell imbalance, BMS inefficiency, thermal gradients
Usable depth of discharge	0.85	Standard usable DoD for off-highway LFP packs with BMS-protected reserve (5 % top + 10 % bottom buffers)
Calendar life cap	12 years	Combined cycle + calendar aging for actively thermally managed packs in Australian conditions
Carbon price per tCO_2e	$75	Clean Energy Regulator, Safeguard Mechanism
Diesel CO_2 factor	2.68 kg CO_2/litre	NGER Measurement Determination, Schedule 1
Hurdle rate	5%	Reference cost of capital for public/private sector
AUD/USD exchange rate	-	Source via RBA historical exchange rates

The maintenance cost differential for battery electric alternatives varies significantly by plant category, reflecting the proportion of total maintenance attributable to the engine and drivetrain versus other components (undercarriage, ground engaging tools, hydraulics, body mechanisms).

The organisation shall apply the reduction percentage corresponding to the plant category that most accurately reflects the assessed plant type:

Table A.2 – BEV Maintenance Reduction by Plant Category

Plant Category	Reduction (%)	Sensitivity Range	Example Plant
Heavy Plant	12	8–20%	Excavators, dozers, wheel loaders, graders, heavy rollers, heavy tractors (>6t operating weight)
Light Plant	20	15–30%	Mini-excavators (<6t), skid steer loaders, compact track loaders, compact wheel loaders, ride-on mowers, compact tractors, wood chippers
Heavy Goods Vehicles	30	25–38%	Rigid trucks (>4.5t GVM), articulated dump trucks, tip trucks, water trucks
Vocational Vehicles	18	12–25%	Waste collection trucks, vacuum trucks, jetter trucks, street sweepers, elevated work platforms
Light Commercial Vehicles	35	28–42%	Vans, utes, light commercial vehicles (<4.5t GVM)
Passenger Vehicles	40	35–50%	Cars, SUVs, light passenger vehicles (<9 seats)
Buses & Coaches	35	20–45%	Transit buses, route buses, minibuses, coaches

Where the assessed plant type does not clearly fall within any category, a default reduction of 20% shall be applied. The organisation shall document the rationale for using the default and explain why no category could be confidently assigned.

The organisation may override a category specific value with product specific evidence. The sensitivity range for the applicable category shall be tested as part of the IRR sensitivity analysis (5.4.3).

Table A.3 – BEV Efficiency by Drivetrain Architecture

Drivetrain Architecture	Wall to Wheel Efficiency	Drivetrain Efficiency	Applies to
Direct drive	0.83	0.92	Hub motors with electric power take off and no hydraulics; Mowers, some compact equipment.
Mechanical reduction	0.79	0.88	Single speed reduction and driveline; Trucks, buses, LCVs, ADTs.
Mixed hydraulic / mechanical	0.68	0.75	Electric drive with hydraulic implements; Dozers, graders, rollers.
Electro-hydraulic	0.58	0.64	Full hydraulic work system; Excavators, wheel loaders.

Note, a charging efficiency of 0.90 is embedded within values in the Wall to Wheel Efficiency column.

Table A.4 – Task Efficiency Credit by Duty Profile

Duty Profile	Credit	Drivers	Example Plant
Urban stop-start collection	0.30	Regenerative braking, idle elimination, proportional draw	Waste collection, recycling trucks
Urban stop-start delivery	0.20	Regenerative braking, idle elimination	Urban delivery trucks, light rigids
Direct-drive light plant	0.20	Proportional draw, idle elimination	Mowers, compact direct-drive equipment
Hydraulic cyclic work	0.12	Proportional draw, idle elimination	Excavators, wheel loaders
Cyclic haul-return	0.12	Regenerative braking on empty descent, idle at load/dump	ADTs, rigid dump trucks, water carts
Highway steady state	0.08	Limited Regenerative braking, minor idle	Highway trucks, coaches
Continuous high load	0.08	Minor idle only	Dozers, landfill compactors

ANNEX B BATTERY REPLACEMENT MODELLING

For battery electric alternatives, the organisation shall determine per product whether battery replacement falls within the service life, and if so the year and cost.

Inputs (per product):

- **Battery Capacity (kWh):** the OEM nominal pack size.
- **Shift Battery Demand (kWh)**: BEV Equivalent Demand / Drivetrain Efficiency
  Represents the energy the battery must cycle per shift on the battery side, excluding the wall-to-battery charging loss (which does not cycle the battery). Drivetrain Efficiency is the battery-to-wheel value from Annex A.
- **Additional Annex A Elements:** Pack Cycle Life, Pack Level Efficacy Factor, Usable Depth of Discharge, Calendar Life Cap, Base Cost, Annual Decline Rate, Battery Cost Floor

Method:

1. **Battery Coverage Ratio** = Battery Capacity / Shift Battery Demand
   For off-shift charging regimes, this informs the multi-product blending weight. For mid-shift charging regimes, the ratio is informational only.
2. **Annual Battery Throughput** = Shift Battery Demand × Shifts per Day × Operating Days per Year
   For off-shift charging regimes, this is capped at one full nominal cycle per day (i.e. Battery Capacity × Operating Days per Year). For mid-shift charging regimes, the throughput may exceed one nominal cycle per day, since the battery is replenished within the shift.
3. **Equivalent Full Cycles (EFC) per Year** = Annual Battery Throughput / Battery Capacity
   One EFC is defined as one full charge-discharge of the battery's nominal capacity.
4. **Cycle Limited Replacement Year** = (Pack Cycle Life × Pack Level Efficacy Factor) / EFC per Year
5. **Calendar Limited Replacement Year** = the Calendar Life Cap (Annex A).
6. **Replacement Year (R)** = the lesser of the cycle limited and calendar limited years, rounded down. If R is greater than or equal to the Service Life, no replacement is required and the cash flow contains no replacement outflow.
7. **Projected Battery Cost ($/kWh) at Year R** = [Base Cost × $(1 - \text{Annual Decline Rate})^R$], or the Battery Cost Floor, whichever is greater.
8. **Replacement Cost at Year R** = Battery Capacity × Projected Battery Cost ($/kWh) at Year R.